

The Mountain Weather Journal

Spring 2009 Edition

What's New???

By: Shawn Harley Meteorologist-in-Charge



Greetings from your friends and neighbors at the National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS) Forecast Office in Jackson, Kentucky. I want to

take a few moments to explain a change in the hail size criterion for severe thunderstorm warnings, and I want to update you on a National Weather Service web page enhancement.

On April 1 the hail size criterion for severe thunderstorm warnings in counties served by the Paducah, Louisville and Jackson, Kentucky National Weather Service Offices changed from three-quarter inch diameter to one inch diameter. The National Weather Service offices in Kentucky now issue severe thunderstorm warnings for storms expected to produce hail one inch in diameter or larger, and/or damaging winds of 58 mph or greater. Special Weather Statements are issued for storms producing hail of less than one inch in diameter. Local Storm Reports continue to be issued for hail of three-quarters of an inch in diameter.

The National Weather Service Central Region has conducted a demonstration in the state of Kansas and adjoining County Warning Areas over the past 4 years, utilizing a hail size criterion for issuance of Severe Thunderstorm Warnings of 1 inch in diameter, rather than the historical three quarter inch threshold. This experiment was based on feedback from local partners, as well as scientific research conducted by Texas Tech University which demonstrated that significant property damage does not occur until hailstone sizes reach 1 inch in diameter. Central Region, along with the NWS Office of Climate, Weather and Water Services, is now taking steps to expand the demonstration area to encompass all Central Region weather offices.

In the Kansas demonstration area customers have indicated high satisfaction with the adoption of the 1 inch hail criterion. Media partners said warnings are more meaningful because the public knows there is a genuine risk of damage when a Severe Thunderstorm Warning is issued. Emergency managers agree warnings carry more weight and credibility.

Next let's take a look at the "point and click" forecast available on our webpage, and an enhancement that makes it much easier to find the forecast for your specific location within a given county. This new feature was made possible with the addition of a Google Earth capability. From our main web page at http://www.crh.noaa.gov/jkl/ you can access your local forecast by clicking on your county that appears on the main map. When the new forecast page pops up you can further refine your forecast location by using the map that appears in the lower right hand corner. This map is a Google Earth map that highlights topographic features, cities and roads. You can zoom in to find the specific location for which you want a forecast, and then click on that spot. The box for which the forecast is valid will show up as a red square on the map. The National Weather Service Forecast office in Jackson provides forecasts with resolution down to 2.5 square kilometers. This allows us to forecast differences that occur due to terrain influences. In eastern Kentucky there can be dramatic differences in the forecast at nearby locations, especially for overnight low temperatures. Nighttime temperature differences of 10 to 15 degrees within very short distances are not uncommon during certain weather situations at certain times of the year. Take a little time to experiment with the map and see how you can get the forecast for your specific area.

All of us at your National Weather Service Forecast Office in Jackson wish you a safe and happy summer. As always, we would appreciate hearing from you. If you have any comments regarding our webpage or the services we provide please give us a call, send us an email, or drop us a note. We are constantly striving to improve our products and services and your feedback is important to us.

Weather Terminology

By: William Modzelewski General Forecaster

With the spring and summer months on the way, severe weather season is also approaching. Below are a few of the weather terms you may hear. Remembering what these terms mean will help you stay safe during hazardous weather.



Severe Thunderstorm -- a thunderstorm with wind gusts of 58 MPH or greater, and/or hail 1 inch in diameter or more and/or a tornado.

Severe Thunderstorm Warning -- Issued by the National Weather Service when a severe thunderstorm is occurring, or indicated by radar. You should take cover if you are in the path of the storm.

Severe Thunderstorm Watch -- Issued when conditions are favorable for the development of severe thunderstorms. When a watch is issued, it means severe weather is possible, but not necessarily occurring. You should keep alert for later warnings.

Tornado -- A violently rotating column of air in contact with the ground. A tornado is associated with a thunderstorm.

Tornado Warning -- Issued by the national Weather Service when a tornado has been reported, or is indicated by radar. You should take cover if you are in the path of the storm.

Tornado Watch -- Issued by the National Weather Service when conditions are favorable for the development of tornadoes. When a watch is issued, it means tornadoes are possible, but not necessarily occurring. You should keep alert for possible warnings. When a watch is issued, it is a good time to review your severe weather safety plan.





Flash Flood -- Rapidly rising water, posing a threat to life and property, with flowing water at least 6 inches deep.

Areal Food -- Flooding that occurs more slowly than flash flooding. Areal flooding can last a day or more after the rain ends.

Special Weather Statement-- Issued for a variety of significant weather conditions, including strong thunderstorms.

Hazardous Weather Outlook -- Issued by the National Weather Service, outlining any hazardous weather expected over the next 7 days.

NOAA Weather Radio -- Broadcasts National Weather Service forecasts, watches, warnings, and other weather information 24 hours a day, 7 days a week. Special signals are transmitted to activate certain weather radios when a watch or warning is issued.



Answers to the Weather Quiz found on Page 8.: (1) Fog, (2) Erosion, (3) Virga, (4) Calm, (5) Rainbow, (6) Visibility, (7) Frost, (8) Wind Chill, (9) Barometer, (10) Fahrenheit

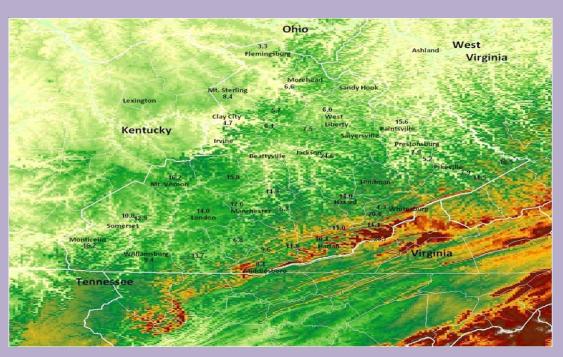
Analyzing Snowfall Based on Slope, Land & Winds Aloft

By: Gary Votaw Science & Operations Officer

A research project was recently completed regarding snow in East Kentucky. It used 58 cooperative (COOP) weather observing sites across the area covering 61 years (1948-2008), plus the airports at Jackson and London. These data were compared with historical data showing winds aloft from the Earth System Research Laboratory web site, near the 2,500 ft, 5,000 ft, 10,000 ft and 18,000 ft levels above mean sea level, over East Kentucky on each day that snow occurred.

Air flowing upslope normally cools because it moves into an environment where the air is thinner. This process often cools the air to the point of saturation and precipitation can sometimes result. Air moving up a mountain slope can enhance precipitation already occurring and that occurs with our snowfall in East Kentucky.

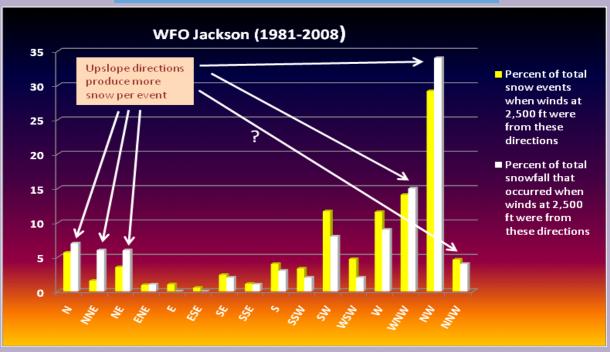
The image below is a topographic map of Weather Forecast Office (WFO) Jackson's county warning area (outlined in white). The numbers are the average annual snowfall in inches from some of the COOP sites across the region (1971-2000). Notice that while sites in the Bluegrass, including those near Mt. Sterling, Flemingsburg, Clay City, and Morehead have averages between 3 and 8 inches per year stations on the higher terrain farther south and southeast average more. Much of our snow occurs while the wind flow is from the northwest which pushes the air up the slope and sometimes increases the snowfall rate.



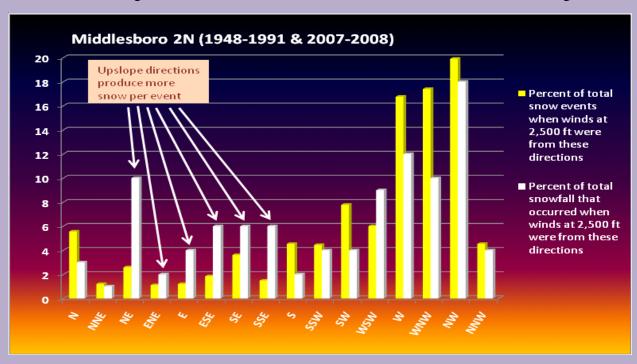
WFO Jackson, at the Julian Carroll Airport on a ridge top averages 24.6 inches per year. Quicksand (not displayed but in the North Fork Kentucky River valley) averages about 14 inches. The chart below shows the 2,500 ft wind directions at which more snow per event occurs at the airport. While a north-northeast wind occurs only 2 percent of the time that direction is much more likely to produce greater snowfall than any other direction. North-northwest is upslope too and it is likely that as more events occur this direction too will show a higher percentage of total snow as the other upslope directions do. Notice also that the southwest and west-southwest directions are most likely to cause lighter snows. The fly in the ointment is that wind directions change often during each event and a forecaster must consider what changes occur with each wind shift! And, what is the total effect of all of the wind flows in each event?

Analyzing Snowfall Based on Slope, Land & Winds Aloft (Cont.)

By: Gary Votaw Science & Operations Officer



A different perspective is provided by Middlesboro 2N (below). This site is located southeast of Pine Mountain and other mountains towards the west through north. Snow often occurs during times of winds from the west through north yet Middlesboro 2N does not experience as much snow during these events due to its location on the lee side of these mountains. However, more of their 8.4 average annual snow occurs when 2,500 ft winds are from the northeast through south-southeast.



These data can be viewed as a check against other data to have higher confidence in boosting (or reducing) forecast snowfall amounts, and provides insight to why a COOP site might report more (or less) snow than a forecaster expects.

Did You Know???

By: Bonnie Terrizzi Recently Retired

It's Raining Cats and Dogs



Sometimes people call the weather office and ask what the forecast is. Sometimes they call to check the current temperature. You expect those calls. But then there are the other calls that come in, such as "Do you know why people say, '*It's raining cats and dogs*'?" With a little research, you learn all sorts of things. The Internet can be a wonderful research tool.

It turns out that the phrase's origin is really unknown, but, there are several theories that recur. The most likely theory goes back to mythology. According to *Brewer's Dictionary of Phrase and Fable*, cats were thought to influence storms, especially by sailors. Dogs were used as a symbol of storms, often accompanying images and descriptions of the Norse storm god Odin, and were thought to be responsible for the strong winds that often accompany storms. Cats were actually thought to be witches who took on the shape of a cat and rode the storm which caused torrential rainfall. Thus, the saying of *raining cats and dogs* refers to both the heavy rain and

strong winds from the storms.

There is another theory from the *Facts on File Encyclopedia of Word and Phrase Origins* on the old expression that is traced to medieval Britain. Poorly constructed of villages often became subject to flooding; often the streets became raging rivers. After the floodwaters receded, dead animals, including dogs and cats, would be found. The local villagers looking upon the numerous dead animals could only think that the bodies must have "rained" down from the storm. Hoping to think our ancestors were not so dim witted, a slightly better theory is that roofs in England during this time period were often constructed from thatched grasses that extended to almost ground level. Seeking warmth, all sorts of little animals would seek shelter by climbing and burying into the roofs, including dogs and cats. During a heavy rain, the grass roof would become slippery, and cats and dogs would come sliding off – thus appearing to be "raining cats and dogs".

A forth theory is a corruption of the archaic French word of *catadoupe* which means a waterfall. The pronunciation of the word, especially by the non-French speaking people of early England sounds a little like 'cats and dogs'. Today however, the equivalent French expression for "it's raining cats and dogs" is "il tombe des cordes" (it's raining ropes).

Whatever the origin, when we hear someone say that it is raining cats and dogs, we don't expect a drop-in-the-bucket, but to batten down the hatches, because it is comin' a gully-washer, or we can expect it to be coming down by the bucket-full, or even raining a real frog-strangler.

To find out what to expect for your weather today, check the Internet at:

www.weather.gov/jacksonky



Aviation

By: Brian Schoettmer Meteorological Intern

Aircraft Structural Icing: Hazards and Mitigation

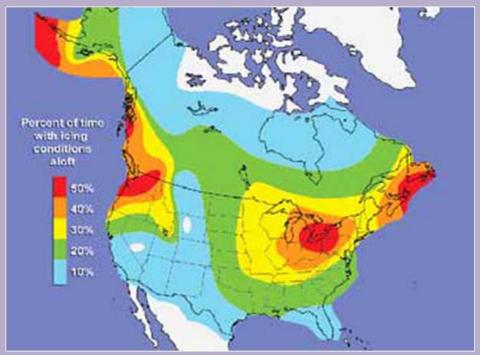


Aircraft structural icing is potentially one of the most dangerous elements a pilot could face with regard to weather. According to the Aircraft Owners and Pilots Association: Air Safety Foundation, from 1990-2000 there were 2,842 aircraft accidents related to weather. Of those accidents, 388 (12%) were caused by some sort of icing, with 105 (27%) of the icing related accidents involving fatalities. Statistics like these should be enough to raise concern about the potential for icing and the dangers it presents to aircraft and passengers. This article will discuss types of aircraft icing, their hazards, and how to mitigate icing problems when they occur. Induction icing, which is ice buildup that affects an aircraft engine's carburetor or air intake, will not be addressed.

Before describing what types of structural icing can affect aircraft, it would help to first explain why icing causes a decrease in aircraft performance. There are a couple of reasons why this happens. The first reason is very simple in that as ice builds up, it is adding weight and drag to the aircraft and will require more power to stay in the air. The second reason is that ice building up on a wing actually reduces its ability to create lift because of the disruption of air flowing over and under the wing. Tests have shown that a layer of frost, ice, or snow with a thickness of sandpaper can reduce lift of a wing by as much as 30 to 40 percent. (Lester, P. F. 1995) As a result of the reduced lift, a pilot has to pitch the nose of the airplane up, requiring more power to maintain level flight and speed. Eventually, if enough ice has accumulated, the aircraft could get to a point where it does not have enough power to maintain level flight and a steady speed. This is the point where accidents are likely to occur because there are only two options for a pilot. The first option is to pitch down (lower) the nose of the aircraft to maintain airspeed; however impact with the ground will eventually occur if ice remains on the aircraft. The other option is to continue trying to maintain speed and altitude, which will then stall and crash the airplane due to low speeds. Obviously, a pilot does not want to be faced with either of those decisions, so the idea is to avoid icing conditions or get out of icing conditions as quickly as possible if they are encountered.

There are three types of aircraft ice, each of which can have a different degree of degradation to an aircraft's ability to maintain flight. The most dangerous form of structural ice is considered to be clear (glaze) icing. This ice is formed when large, nearly freezing, or "super-cooled" raindrops strike a surface that is below freezing, such as a wing or fuselage of an airplane. What makes this form of icing so dangerous is the fact that it does not freeze right away, and actually has time to spread out across the airframe. A second, more common and less dangerous form of icing, is called rime icing. This is caused when an aircraft is flying through frozen precipitation of some sort, and is slowly accreting to the aircraft. This form of icing is generally less dangerous because large amounts of ice are not able to accumulate and the added weight of the ice is less than with other forms. The third type of icing is actually a mixture of the first two types of icing and is called mixed ice. (Lester, P. F. 1995)

In what types of weather conditions should a pilot expect to see icing conditions? Generally, one can expect a potential for icing conditions when there is some sort of upward vertical motion in a layer of air that is moist enough for clouds to form, and the cloud temperatures are cool enough to support "super-cooled" water droplets or ice crystals. These conditions are most commonly found in warm/cold frontal boundaries, showers and thunderstorms, and orographic lift caused by terrain. It is estimated that 85% of all icing occurs near frontal boundaries. (**Lester, P. F. 1995**) Which type of icing occurs depends on the temperature through a certain layer of air. Clear icing is more likely to occur with temperatures that are closer to the freezing mark (0 C/32 F to -10 C/14 F). To understand why, recall the term "super-cooled" which means almost/near frozen. Larger rain drops that are near freezing are more likely to be found in a layer of air that is between 0 C/32 F and -10 C/14 F degrees Celsius. Rime and mixed icing are more likely to occur in a colder air mass (-10 C/14 F to less than -20 C/-4 F) where ice crystals are present and precipitation can be in the form of snow or freeze instantaneously to an aircraft surface. (**Lester, P. F. 1995**)



The image above, courtesy of NASA, indicates the percentage of time with icing conditions aloft from a November through March time frame.

How do pilots mitigate icing or get out of icing conditions if encountered? Many modern aircraft are equipped with devices designed to prevent icing (anti-icing) or break apart existing ice (de-icing) on aircraft control surfaces. Anti-icing equipment, designed to prevent ice from forming, usually consists of a liquid solution that is sprayed on control surfaces to keep ice from forming on them. Heated wings are also used, but mainly on larger aircraft, such as airline jets. De-icing equipment consists of devices used to break apart existing ice. De-icers are most commonly found in a "boot" form. Boots are inflatable rubber surfaces on the outside of an aircraft that can inflate and break apart existing ice. (http://www.aopa.org/asf/publications/sa11.pdf)

Obviously, the safest way to avoid icing conditions is to not fly into them in the first place. However, if icing conditions are encountered a pilot should try to fly out of the icing area as quickly as possible, especially if the airplane is not equipped to fly into known icing conditions. A few tips provided by the Aircraft Owners and Pilots Association: Air Safety Foundation follow: (1.) Get good weather information before you take off. (2.) Avoiding clouds, including not flying underneath them, will eliminate any icing threat because there must be moisture present for an icing threat. (3.) Know what type of synoptic weather pattern you are flying in. In other words, know about any warm or cold fronts in the area, which would be more likely to produce icing conditions. (4.) Finally, know your escape routes should you run into icing conditions. These routes could include lower altitudes, higher altitudes, or turning around. Knowing surface temperatures at all times could be a clue as to whether or not you need to descend to get out of icing. Sometimes climbing to a higher altitude could be a better option if there is an inversion (warm layer) above you.

For more detailed information about aircraft icing some of the following links might help:

http://www.aopa.org/asf/publications/sa11.pdf

For icing forecasts produced by the Aviation Weather Center in Kansas City, go to:

http://adds.aviationweather.gov/icing/

References

Lester P. F. (1995). Aviation Weather. Englewood, CO: Jeppesen.

http://www.aopa.org/asf/publications/sall.pdf

http://adds.aviationweather.gov/icing/

Hydrology

By: Peter Geogerian General Forecaster



Review of National Flood Safety Awareness Week

March 16-20, 2009

As part of National Severe Weather Awareness month, National Flood Safety Awareness Week highlights important information on how to better prepare people for flooding. Each day featured a different subject. Day 1 featured The Advanced Hydrologic Prediction Service or AHPS which provides water prediction and delivery methods to serve your needs and the needs of all our partners. Day 2 featured Turn Around, Don't Drown or TADD, which is a joint effort between the National Weather Service and the Federal Alliance for Safe Homes. TADD emphasizes the dangers of flooded roadways, and communicates the importance of using good judgment. Allow extra time to reach a destination via another route. It's not worth risking your life. Remember, Turn Around, Don't Drown. Days 3-5 featured discussion on flood safety and preparation, as well as flood insurance and flood risk. More detailed information about flood safety awareness week is available at: www.weather.gov/ floodsafety.

Visit us on the web at: http://www.weather.gov/jacksonky

Weather Quiz

By: Tabitha Brewer Administrative Support Assistant

Fill in the blanks with the words listed below. Answers can be found at the bottom of Page 2.

Erosion

Fahrenheit

Virga

Barometer

Visibility Wind Chill Rainbow Frost Calm Fog 1. A visible aggregate of minute water particles which are based at the Earth's surface and reduces horizontal visibility to less than 5/8 statue miles. Unlike drizzle, it doesn't fall to the ground. 2. Wearing away of the lands by running water, glaciers, winds and waves. 3. Falling precipitation, usually ice, that evaporates before reaching the ground. 4. A condition where no air motion is detected. 5. An arc that exhibits in concentric bands the color of the spectrum and is formed opposite the sun by refraction and reflection of the sun's rays in rain drops. 6. The greatest distance an observer can see and identify prominent objects. _ 7. The formation of ice crystals on the ground or other surfaces in the form of scales, needles, feathers or fans. 8. The effect of the wind on people and animals. It is based on the rate of heat loss from exposed skin caused by the wind and cold. 9. An instrument used for measuring air pressure. 10. The standard scale used to measure temperature in the

United States in which the freezing point of water is 32

degrees.

Fire Weather

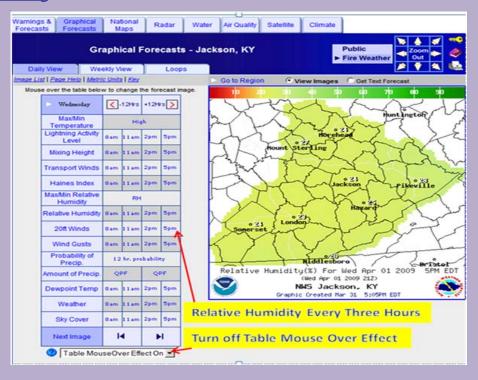
By: Jonathan Pelton Incident Meteorologist

Fire Weather Grapical Forecasts and You

In addition to the regular forecast graphics, fire weather graphics are also available on the <u>Jackson National Weather Service Forecast Office webpage</u>, and for all locations across the country as well. Specifically, the fire weather grids can be found at the following website: http://www.weather.gov/forecasts/wfo/sectors/jkl.php. Once you have loaded the page, click on Fire Weather in the upper right hand corner of the page near the zooming features. Using your mouse and the arrows you can move forward in time or alternatively use the tabs for a weekly view or loop. The forecast elements available are Max/Min Temperature, Lightning Activity Level, Mixing Height, Transport Winds, Haines Index, Max/Min Relative Humidity, Relative Humidity, 20ft Winds, Wind Gusts, Probability of Precip., Amount of Precip., Dewpoint Temp., Weather, and Sky Cover. Definitions and further information on what these elements represent can be found by running the mouse over the names of the forecast elements if the mouse over effect is on. The image below is an example Fire Relative Humidity Graphic and highlights some features of the graphical page.

If you have debris to burn, it is a good idea to be aware of current forecasts of relative humidity and wind. Generally, relative humidity below 30 percent combined with 20ft Winds of around 10 mph or more can lead to conditions where debris burning could get out of hand. If one or both of these values fall within the criteria mentioned above, it might be good to postpone burning until a time when the relative humidity is higher and/or 20ft Winds are lighter. These conditions usually occur during the afternoon hours, but most of the time, 20ft Winds decrease and relative humidity increases during the evening hours. On most nights, relative humidity is at its highest and 20ft Winds are at their lowest during the overnight hours and in particular just before sunrise. During very dry periods or stormy weather this may not be the case. With this in mind, Kentucky state law makes it illegal to burn anything within 150 feet of any woodland or brushland, except between the hours of 6 p.m. and 6 a.m. during the fire season.

In Kentucky, the fire season is broken into two parts. The spring season runs from February 15th through April 30th, while the fall season runs from October 1st through December 15th. For additional information on the fire season and burning laws, visit the Kentucky Division of Forestry website. For detailed information on protecting your home from wildfires, visit the Firewise website at www.firewise.org.



Climate Summary

By: Jeffrey Carico Hydrometeorological Technician

Winter Season 2008 - 2009 Climate Summary

The winter season of 2008-09 saw wetter than normal conditions along with below normal temperatures. The Jackson Weather office and the London-Corbin Airport finished December and January wetter than normal with February checking in much drier than normal. London finished up about half an inch above normal while Jackson ended winter nearly three inches wetter than normal. Of further interest, the 2008-09 winter was the 5th wettest at Jackson, while it was only the 14th wettest winter at London. Both locations experienced much colder than normal temperatures for January while December and February were near or above normal. Jackson ended winter with temperatures averaging about a half degree colder than normal with the London-Corbin Airport just a couple of tenths of a degree below normal. The winter of 2008-09 was the 10th coldest winter at Jackson, while strangely it was the 17th warmest winter at London.

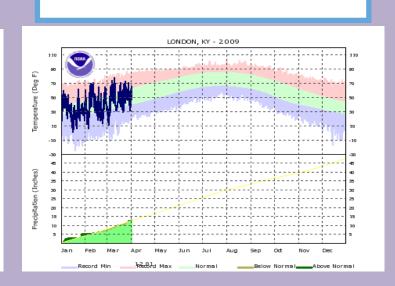
The Jackson Weather Office ended the season with a maximum average temperature of 45.4 degrees and a minimum average temperature of 27.1 degrees. The mean temperature for winter 2008-09 was 36.3 degrees which is 0.4 degrees below the normal temperature of 36.7 degrees. The winter of 2008-09 was the 10th coldest on record since the Jackson Weather Office opened in 1981. Additionally, January 2009 was the 7th coldest January on record. Jackson recorded 14.39" of precipitation during the winter season which is 2.88" above the normal of 11.51". This winter saw Jackson ending up as the 5th wettest winter. Jackson also saw its 3rd wettest December, 4th wettest January and 3rd driest February. Jackson received 26.2" of snow over December, January and February. Jackson normally sees 18.9" during the winter months. The 2008-09 winter season was the 6th snowiest winter of all time. Furthermore, all the winter months ranked in the top ten snowiest of their respective months. December 2008 was the 8th snowiest, while January was the 7th snowiest and February ranked at the 5th snowiest February.

The London-Corbin Airport finished winter with an average temperature of 37.0 degrees which is 0.2 degrees below the normal of 37.2 degrees. London had a maximum average of 47.3 degrees, with a minimum average of 26.8 degrees. London received 12.52" of precipitation through December, January and February which is 0.48" wetter than the normal of 12.04". the winter of 2008-09 was the 14th driest winter at London, but January 2009 was the 9th wettest January since records began in 1954. No snow data is recorded at the London-Corbin Airport.

Looking ahead towards summer 2009, the Climate Prediction Center has indicated Eastern Kentucky has equal chances of seeing below, above or near normal temperatures and precipitation over June, July and August.

CLIMATE CHART FOR JACKSON

CLIMATE CHART FOR LONDON



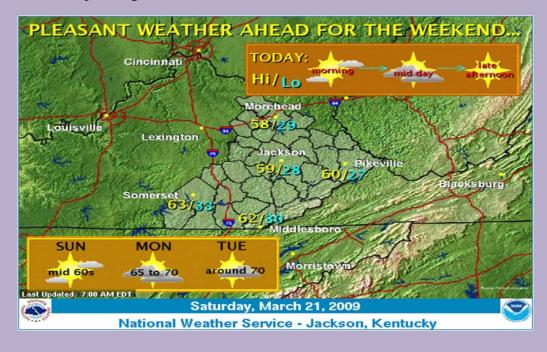
Weather Story

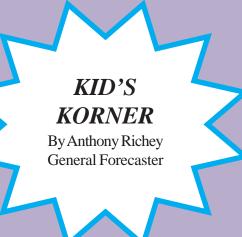
By: Charles Greif Lead Forecaster



One of the most popular pages on our website over the past year has been our weather story graphic. Every morning our forecasters pick out the upcoming weather features and conditions they feel will be most impactful for the area over the next day or two. These fun and colorful forecast graphics are usually prepared in the early morning hours, and are designed to be available by 8 am. The forecast graphic is occasionally updated later in the day or evening.

Sometimes they depict the weather features and temperatures for the day ahead like the one above. Other times they can detail an outlook for the upcoming weekend as seen in the one below:





Draw a line from the word in the box to the picture it describes.











Hurricane





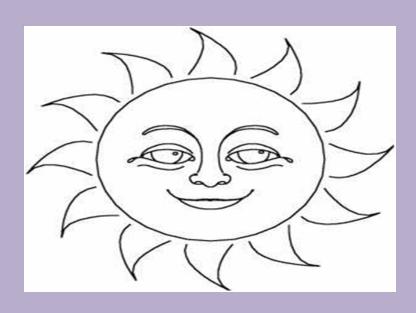
Hail Tornado



Flood

Lightning





Color me



Find the words listed in the green box below. Circle each word. The words may be hidden in any direction: vertically, horizontally or diagonally.



BAROMETER, CLOUDS, COLD, DEW, DROUGHT, FLOOD, FREEZE, FRONT, FROST, HAIL, HEAT, HUMITIDY, HURRICANE, LIGHTNING, PRESSUE, RADAR, RAIN, RIME, SHOWERS, SLEET, SNOWFLAKE, SUNSHINE, THERMOMETER, THUNDERSTORM, TORNADO, WARM, WIND